REMARKS/ARGUMENT

By this amendment, claims 1-20 remain pending in this application. Claims 1, 2, 7, 12, 13, 16, 17, 19 and 20 have been amended. No new matter is added. Applicants reserve the right to pursue the original claims in this application and in others. Applicants respectfully request reconsideration in view of the above amendments and the following remarks.

In numbered paragraph 2 of the Office Action, claim 2 is objected to as containing certain informalities. Applicants have amended claim 2 and submit that the amendment cures the noted deficiencies. Accordingly, Applicants respectfully request the Examiner for withdrawal of the objection.

In numbered paragraph 4 of the Office Action, claims 1-20 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants have amended the claims to cure the noted deficiencies and respectfully submit that the rejection is now overcome.

In particular, in numbered paragraph 10 of the Office Action, certain terms in claims 1, 2 and 13 are rejected as being indefinite because the terms are "relative." Applicants disagree.

The fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite under 35 U.S.C. § 112, second paragraph. Seattle Box Co. v. Industrial Crating and Packing, Inc., 731 F. 2d 818, 221 U.S.P.Q. 568 (Fed. Cir. 1984). Acceptability of the claim language depends on whether one of ordinary skill in the art would understand what is claimed, in light of the specification. In this regard, the Examiner's attention is directed to, for example, page 15 of the Applicants' specification and the related discussion to Figure 5 wherein specific examples/ranges of "low" temperatures and "high" temperatures are disclosed. Hence, the metes and bounds of the claim language are clearly defined in the specification. Accordingly, Applicants submit that the rejection is overcome and respectfully request the Examiner for withdrawal of the same.

In numbered paragraph 2 of the Office Action, claim 1-5, 7-9, and 12-20 are rejected under 35 U.S.C. § 103(a) as being obvious over Okamoto (U.S. 2001/0027856A1) in view of Teeg et al. (U.S. Patent No. 3,565,671). In numbered paragraph 21 of the Office Action, claims 1, 6 and 10 are rejected under 35 U.S.C. § 103(a) as being obvious over Okamoto in view of Teeg and further in view of Hasuda (U.S. Patent No. 4,666,760). In numbered paragraph 28 of the Office Action, claims 1 and 10 are rejected under 35 U.S.C. § 103(a) as being obvious over Okamoto in view of Teeg and further in view of Djorndahl (U.S. Patent No. 6,005,771). Applicants respectfully disagree.

A feature of the heat controller, as recited in claim 1, that is neither disclosed nor suggested in the prior art includes, in part:

> "a base material *radiating* a large amount of heat at a high-temperature phase."

Thus, the heat controller of claim 1 comprises a composite material having a base material which <u>radiates</u> a large amount of heat at high temperatures.

In contrast to the present invention as recited in claim 1, the disclosure of Okamoto does not teach or suggest a composite material comprising a base material which radiates a large amount of heat (admitted in numbered 16 of the Office Action). However, the Office Action cites Teeg as curing this deficiency.

Apparently, the Examiner has mistakenly equated heat "reflectivity" with that of heat "radiation" (see numbered paragraph13 of the Office Action). In other words, the Examiner has concluded that a material which has a high degree of heat reflectivity also has a high degree of radiation. This assumption is incorrect. In fact, heat reflectivity and heat radiation have an inverse relationship. In other words, a material which has a very high degree of heat reflectivity will have a low heat radiation ratio (i.e., heat radiation efficiency = 1 - reflectivity ratio).

Note, the heat controller of Teeg comprises a highly reflective metal coating 12 (e.g., aluminum) which reflects an incident light at high temperatures, as a phase change coating 14 becomes transparent with respect to the incident light. But, the present invention as recited in claim 1, provides a heat controller comprising a base material having a high heat "radiation" efficiency at a high-temperature phase for affecting heat control. In other words, the heat controller of Teeg attempts to moderate/control heat by reflecting light away from the object as opposed to the heat controller of claim 1 which seeks to dissipate heat from/within the object, as the object increases in heat and/or temperature. Note, if the reflective metal coating 12 of Teeg were utilized in the present invention, it would not be operable since the temperature of the object itself would not be sufficiently controlled because the heat generated in the object can't be radiated out of the object. Hence, the disclosure of Teeg even when combined with that of Okamoto does not teach or suggest the heat controller as recited in claim 1 of the present invention. Accordingly, Applicants submit that the rejection is overcome and respectfully request the Examiner for withdrawal of the same.

Claim 13, similar to claim 1, recites a composite material formed of a base material which "radiates" a large amount of heat at a high-temperature phase. Accordingly, claim 13 should be allowable along with claim 1 for at least the reasons as provided above. Claims 2-12 and 14-20 depend from claims 1 and 13, respectfully. Accordingly, these claims should be allowable along with claims 1 and 13 for at least the reasons provided above and for its own unique combination of features which are neither taught or suggested by the prior art.

Hasuda an Djorndahl are cited for other features and do not cure the deficiencies of Teeg.

In view of the foregoing, each of the presently pending claims in this application are believed to be in immediate condition for allowance. Accordingly, Applicants respectfully request the Examiner to allow the claims and to pass this application to issue.

Respectfully submitted,

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APPENDIX A
Version With Markings To Show Changes Made
37 C.F.R. § 1.121(b)(1)(iii) AND (c)(1)(ii)

SPECIFICATION:

Paragraph at page 1, line 18, to page 1, line 22:

In general, in a space vehicle traveling through a vacuum environment, radiation of heat into space via the outer skin of the space vehicle serves as a means of heat [released, the amount of the heat radiated governing the temperature of] regulation for the space vehicle.

Paragraph at page 1, line 23, to page 1, line 28:

For this reason, many techniques have been developed [as methods of] to [preventing] prevent a great increase or a great decrease in temperature and for maintaining the temperature within an appropriate range when there are large changes in the amount of internally generated heat within the space vehicle [of the like].

Paragraph at page 4, line 4, to page 4, line 8:

In the above-noted examples of known technology, however, the phase-change substance used is one type, perovskite Mn oxide or the like, so that at high temperatures the heat radiation efficiency is high and at low temperatures the heat radiation efficiency is low.

Paragraph at page 7, line 3, to page 7, line 16:

More specifically, in the present invention, a phase-change substance 1 having a thickness of several microns (μm) to 30 microns (μm) and having insulation properties at a low-temperature phase and metallic properties at a high-temperature phase is formed by a coating method, a printing method with a thick film, a vapor deposition method or the like, on a low-density base material made of silicon[e], alumina, partially stabilized-zirconia, or the like, having a thickness of 10 to 100 microns (μm) with sufficient strength and toughness and having a high radiation ratio, the resulting composite material being mounting so as to be in good thermal contact with an object requiring heat control, thereby forming a heat controller with a simple configuration.

Paragraph at page 10, line 6, to page 10, line 10:

The base material 2 used in the present invention can be [silicon] silicone, alumina, partially stabilized-zirconia, or the like, and it is desirable that this base material 2 exhibit flexibility, in the form [or] of a sheet or film, so that it can be [caused to bend] bent or [curve] curved.

Paragraph at page 13, line 27, to page 13, line 28:

[Silicon] Silicone, alumina, partially-stabilized-zirconia, or the like, can be used as [this] the flexible base material 2.

CLAIMS:

1. (Amended) A heat controller for an object comprising:

a composite material comprising:

a base material radiating a large amount of heat at a high-temperature phase [,]; and [in combination material]

a phase-change substance overlying said base material having insulation properties at a high-temperature phase, [having] metallic properties at a low-temperature phase, radiating a large amount of heat at a high-temperature phase, radiating a small amount of heat at a low-temperature phase, and having a high reflectivity [with respect to] in the thermal infrared light region at a low-temperature phase[,] .

[said composite material controlling a temperature of an object.]

2. (Amended) A heat controller according to claim 1, wherein said phase-change substance comprises a thickness in the range from about one to [several tens] about thirty microns. [, which being formed by either one of a coating method, a printing method with a thick film, a depositing method or the like.]

7. (Amended) A heat controller according to claim 1, wherein said base material [being made of a material] is selected from a group consisting of silicone, alumina, and partially stabilized-[zircconia] zirconia. [or the like and each possessing flexibility.]

12. (Amended) A heat controller according to claim 1, wherein said object includes [electric or] an electronic circuit used in a space vehicle, including a man-made satellite and a spaceship.

13. (Amended) A method for controlling heat[,] in an object comprising: [whereby]

providing a composite material on said object, said composite material formed of [by combining] a base material radiating a large amount of heat at a high-temperature phase; and

providing [with] a phase-change substance on said base material having insulation properties at a high-temperature phase, [having] metallic properties at a low-temperature phase, radiating a large amount of heat at a high-temperature phase, radiating a small amount of heat at a low-temperature phase, and having a high reflectivity in the thermal infrared region at a low-temperature phase. [is mounted either directly or indirectly to an object, so as to control the temperature thereof.]

17. (Amended) A method for controlling heat according to claim 13, wherein said base material [being made of a material] is selected from a group consisting of silicone, alumina[,] and partially stabilized-zirconia. [or the like, and each possessing flexibility.]

19. (Amended) A method for controlling heat according to claim 13, wherein said composite material is affixed to a surface of [a heat-generating] said object, either directly or via an intervening heat-conductive substance.

20. (Amended) A method for controlling heat according to claim 13, wherein said object includes an [electric or] electronic circuit used in a space vehicle, including a man-made satellite and a spaceship.

Abstract Of The Disclosure:

A heat controller [has] for an object, having a composite material formed [by combining] of a base material radiating a large amount of heat at a high-temperature phase [with] and a phase-change substance having insulation properties at a high-temperature phase, having metallic properties at a low-temperature phase, radiating a small amount of heat at a low-temperature phase, and having a high reflectivity in the thermal infrared region at a low-temperature phase. [so as to control the temperature of an object.]